

## Living Energy Farm

### May - June 2019 Newsletter

#### Expanding LEF's Model

We are expanding the LEF model. We estimate the cost of putting small electrical systems in 100 homes in Arizona at about \$30,000, which includes training and paying local people to work on the project. We have raised about \$11,000 so far. We have donors who have promised to help with the battery expenses.

In Africa, there are *600 million people* without electricity. The reason these people do not have electricity is because the design of our energy systems is based on centralized AC grids and overbuilt off-grid systems that mimic AC grids. LEF's approach represents another way -- small scaled energy systems designed to meet human needs in an affordable, durable fashion. Getting these systems installed so people can see the difference will change the course of history. We plan to have a pilot project in Ghana Africa in 2020. We can use your support. Donate at <https://donatenow.networkforgood.org/1388125> Designate Living Energy Farm Education Fund.

#### Climate Justice

In our last newsletter, we talked about our trip to Arizona to install solar lighting and charging systems in 7 homes there. For a little history of the situation on the Navajo Nation, see the last newsletter.

It is the great irony of our time that although the poor majority of humanity has done the least to create climate change, they are suffering the soonest from its impacts. Arizona, like everywhere else, has been experiencing more weather extremes. Such extremes make life more difficult for people with modest incomes. Expanding the LEF model is one small thing we can do to redress this imbalance.

The ordinary off-grid model has been so corrupted by consumerism that it has become an all or none proposition. If you don't have grid power, your choices are to buy small "solar lanterns" (that don't last very long and are extremely expensive for what they illuminate), spend thousands of dollars for a conventional off-grid kit that will be dead in a few years, or live in the dark. On the Navajo reservation, there are 15,000 people in this situation. The LEF model creates a whole new option -- durable, effective solar lighting and charging systems for as little as \$300.

Expanding the LEF model in Arizona will have a number of impacts:



*Nickel iron batteries undergoing endurance testing.*

1) We provide lighting to some of the lowest income people in the U.S.

2) We create a "third way" so people in Arizona -- and everywhere else -- can have modern services without grid power. The more our system gains recognition, the more people will feel comfortable making that choice.

3) Our Arizona project will make it possible to expand into other parts of the world where people need electrical service.

4) We are building a foundation for an alternative to grid power.

We are networking with other organizations who have some interest in our Arizona efforts. The Hopi Community Development director is very excited about what we are doing. We have also started talking with the Tutskwa Permaculture Center (see <https://www.hopitutskwa.org>) about partnering with them to do more solar work. We will be seeking media attention, and will keep you posted as that evolves.

### **Performance Testing Nickel Iron Batteries**

We have been importing nickel iron (NiFe) batteries from two different Chinese manufacturers. We have been performance testing both kinds to get a clearer understanding of how well they work. We have some small meters that measure voltage, amp-hours, watt-hours, and other electrical characteristics of how the batteries perform.

We have personally experienced the tenacity of NiFe batteries for 8 years now. Long cloudy spells in the winter may be gloomy, but they have no noticeable impact on our batteries or our electrical system. Many early winter mornings I have awoken to find the voltage on our NiFe batteries higher than it was at 10 PM the night before. "What, they got nuclear reactors inside these things?" I have asked myself. Makes no sense. Any electrician knows that any electrical circuit can have phantom voltage -- a few stray electrons that get the volt meter excited without representing any real power. The power remaining in a drained NiFe set is not phantom. These batteries just don't give up.

After watching the meters as we have been running our tests, we understand what's happening a bit better. Basically, NiFe batteries will provide a fairly strong electrical current flow within their rated discharge range. But they actually prefer to surrender their electrons very slowly. If you put a



*Biogas digester -- larger, insulated, solar heated.*



*Biogas toilet with manual (pressurized) flush, uses a very small amount of water.*

NiFe battery set under heavy load, the voltage will fall. If you reduce the load -- still drawing current, just less of it -- the battery voltage will climb back upward, for hours. This is true even when the batteries have been drained 120 - 150% (!!!) beyond their rated capacity. **Our 8 year old, 100 amp hour NiFe battery set, which is nominally a 12 volt set, easily puts out 120 amp hours without ever dropping below 12 volts. That's 120% output for a battery set that would be ready for retirement if it were any other kind of battery.**

We have been saying for years that the "amp hour" ratings for batteries are completely wrong. That is still true, but now it's a little more clear what "wrong" means. Basically, a brand new lead-acid or lithium battery will give you something very close to its rated output. And if you drain it down below its rated voltage range, you damage it badly. If you drain it repeatedly, you destroy it. "Deep cycle" batteries are a horrible misnomer. The output of NiFe batteries is far beyond their rating, especially when they are used the way we use them at LEF. Mind you, if we were using lead acid batteries or any kind of lithium, after 8 years we would already have replaced them.

At LEF we have discovered -- by happy accident honestly -- that NiFe batteries are immaculately well suited to a DC Microgrid like at LEF. We need our NiFe batteries to sustain a low drain rate over very long periods of time. It turns out that is what they do - very, very well. Let's say you were using batteries in an emergency situation, and you realized that you needed to keep the lights and vital communications/ cell phones on as long as possible with no additional inputs. If you have DC LED lights connected to any other battery system, you would drain them down. With NiFes under modest load, they just keep going and going and going far beyond their rated output, for days and days on end. We have found it difficult to conduct our tests properly because we can't figure out when to stop.

Having moved our heavy loads to daylight drive, our NiFe batteries just never seem to stop putting out electricity. In our 8 years of using NiFes, we have never had a power outage. We use the lights on the internet as much as we choose. We let anyone who needs to charge their laptops and devices. **We have never seen our modest NiFe set drop below 12.2 volts in normal use no matter how bad the weather or how much we use them.**



*Biogas burner. We have never been able to get biogas to burn well through a conventional gas burner -- not sure why.*



*No till beans -- success!*

## Homemade Nickel Iron Batteries

A couple of months ago, we would have said that making NiFe batteries is a distant and indistinct dream. A couple of things have changed. We now have 5 skilled people in various locations contributing ideas and work towards making them. Eddie Crowley (who was an intern at LEF) and Alexis began taking apart NiFes to build simplified prototypes a couple years ago. Eddie has 13 years of experience working in the electrical trades and is currently working as a commercial electrical inspector. I asked our friend Kris Ward in Missouri, who has had a formative impact on LEF, to get involved. He has over 60 years experience in the machine tool trade and

extensive experience building and repairing a wide range of modern and historic machines. A few months ago, Tim Dabbs got involved. He has 40 years Physics R&D, mainly in optics, material science and sensors, and currently works in that industry. Most recently, Robert Bruce got involved. He is an industrial designer with broad experience designing metal fabrication processes in industry using computer tools, and has worked extensively on entrepreneurial projects.

With these folks working on the project, it's outlook has brightened significantly. It now seems very likely that we will be able to produce NiFe batteries this year. Our goal is set up a prototypical NiFe production shop here at the farm. We will then set up more shops, hopefully in Arizona, Ghana, and other locations where we are trying to spread the LEF model. We hope this catalyzes a revolutionary impact on our species' relationship with energy.



*50 feet down the same row, and our no till has weeds. No till is a challenge.*

## Better Cooking Technology

At LEF, our DC Microgrid has worked incredibly well. Our cooking systems admittedly, have not fared in kind. We are still cooking with wood, mostly on rocket stoves. We have small solar cookers, and they work fine if you are able to cook when the sun is shining brightly. We worked on a high-temperature solar storage system, but we just couldn't get it to fly within a reasonable cost budget. Now we are returning to biogas.

Biogas is methane is natural gas, and it's not hard to make.



*Great peanut crop this year, and a big contribution to food self-sufficiency for LEF.*

We have a system set up that is hopefully much better than the one we built at LEF in the early days. This one is solar heated, and insulated, so it should maintain an optimum temperature for making gas. It may be smaller than what we need long term, but we want to learn how to maximize gas output before investing in a community scale system.

Biogas is like a compost pile -- it needs a balance of carbon and nitrogen as fuelstock. We are using human waste for nitrogen, because that's what we have. We have built a solar powered wood grinder to reduce woody/cellulosic material to a coarse dust that can then be fed into the digester. The grinder will provide us with a critically necessary source of carbon for the biogas digester. One of the best sources for information about community scale biogas is the Chinese Biogas Manual, available online. During the Cultural Revolution, the Chinese built thousands of biogas digesters. They grew cellulosic crops specifically to make biogas.

The problem is that cellulose breaks down slowly in a digester, so they pre-composted it, then fed it into the digester. That is our plan with the output from our wood grinder.



*Chinese combine. It works, and has taught us a lot about small combine design. We have a much simpler design on paper.*

### **How's the Farm?**

The farm is doing well this year. We had a more stable spring in terms of temperature and rainfall than we have had in years. We are headed for an excellent fruit year. The persimmon trees are loaded with fruit. We are hoping to do a persimmon festival in the fall. The seeds crops are planted and growing. We are growing the usual spread of vegetables and grains for both seeds and food. Seed crops this year include corn, watermelons, winter squash, okra, and peppers. We have a larger peanut crop this year specifically for food, to try to see if we can meet the insatiable demand for peanut butter among the younger set with homegrown peanuts. Our experiments with organic no-till are proceeding. We are learning. Rye is easier to kill as a cover crop than winter peas. We have planted our bean crop -- pintos and black beans -- straight into cover crop with no tillage, right in front of the house so we can keep the deer off of them. Having increased the production of grains and beans, we will not be buying much more than a bit of fresh fruit in winter this year.

We harvested our wheat crop this year, and we have more than enough to feed us and our ducks. We imported a small Chinese combine last year. It is effective, but it takes some effort to make it cooperate. Two projects currently on the back-burner at LEF are farm grown fuels for small tractors (woodgas, turpentine, gasified resin maybe....) and a better small scale grain harvester. This little Chinese combine has been useful in teaching how a small combine works, and doesn't. Our little combine works, but it's over-designed. It is far more complex than it needs to be. We have an on-paper design for a much simpler harvester that we are confident will work. It could have a big impact for small farmers around the world.

Rosa and Nika are doing great. Rosa is learning how to use the internet to research animals. She spends quite a bit of time in neighboring communities as part of a homeschool cooperative. Nika is developing a very outgoing personality. In summer, we get a larger flow of interns and visitors. Nika engages them tirelessly. We make use of our triple bike to take then kids are further and further outings these days. The kids love it.

*Living Energy Farm is a project to build a demonstration farm, community, and education center in Louisa County that uses no fossil fuels. For more information see our website [www.livingenergyfarm.org](http://www.livingenergyfarm.org), or contact us at [livingenergyfarm@gmail.com](mailto:livingenergyfarm@gmail.com) or Living Energy Farm, 1022 Bibb Store Rd, Louisa VA, 23093. Donations to the Living Energy Farm Education Fund are tax deductible.*

### **Articles and videos about LEF:**

**How to Live Without Fossil Fuel (Introductory Video)** <https://www.youtube.com/watch?v=Ri2U6u8p65E>  
**Powering a Community with Solar Electricity** (LEF has the only DC powered community that we know of, here's how it works) <https://www.youtube.com/watch?v=FvdExgvHnRI&t=23s>  
**The Best Way to Store Off-Grid Energy Batteries that Last (almost) Forever** <https://www.youtube.com/watch?v=2wOxQ3sL9zc>  
<https://www.youtube.com/watch?v=dfrgLsyFs0E>

Virginia Homegrown created a program at LEF (the LEF part starts at the 29 minute mark in the program)  
<https://www.youtube.com/watch?v=MDGP0C9MIzU>

International Permaculture has done 2 articles on LEF. One is in issue #93, Autumn 2017, and the second is in issue #94, Winter 2017. See <https://www.permaculture.co.uk/>

Article about LEF at the Atlantic Online Magazine

<https://www.theatlantic.com/politics/archive/2017/01/anarchism-intentional-communities-trump/513086/>

Article about LEF in The Central Virginian

<http://www.livingenergyfarm.org/cvarticle.pdf>

LEF on CNN

<http://www.cnn.com/interactive/2015/09/us/communes-american-story/>

Cville weekly in Charlottesville VA

<http://www.c-ville.com/off-grid-model-environmentalism-made-easy/#.VcHobF054yo>

First video on youtube

<https://www.youtube.com/watch?v=ppTBO8d6jhY>

Second video on youtube

[https://www.youtube.com/watch?v=wdSX\\_TIYkD4](https://www.youtube.com/watch?v=wdSX_TIYkD4)

Video on vimeo

<https://vimeo.com/128744981>

Slideshow produced by Alexis a while ago

[https://www.youtube.com/watch?v=4x\\_C3iScoAw](https://www.youtube.com/watch?v=4x_C3iScoAw)